

THE STUDY OF SOME DISEASE – RESISTANT APPLE CULTIVARS, GROWN IN NORTH-WESTERN ROMANIA ON A PHREATIC WET CHERNOZEM

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Abstract

The cultivation of apple may be super-intensified by planting trees at close distance (4/2, 4/1, 3/2, 3/1 m) on a phreatic wet chernozem and managing the trees in palmetto system, orienting the branches in row direction. As ripening period, Romus 3 is harvested within 10 – 20 of July, being a summer variety, and the others after the 20th of September. Florina, Auriu de Bistrița and Liberty cultivars obtain medium production of 48.2 t/ha, 45.5 t/ha and 42.0 t/ha over the three years of study. Except for the Romus 3 variety, all other varieties fall into groups with large and very large fruits. The weight index varies between 114.2 g in case of Romus 3 variety up to 186.7g in case of Florina variety. Fruit quality planted at a close distance is insignificant, influence by reducing their size. Values of the dry substance above 12% are present in case of Florina, Liberty and Romus 3.

Keywords: hybrids, phenophases, super-intensive

INTRODUCTION

The disease – resistant cultivars have revolutionized apple cultivation in the last two – three decades, both worldwide and in our country. (Amzăr, Braniște, 2000, Bout, 2003, Drăgănescu, 2002, Șcheau, 2006)

Usually, the introduction and the study of their behavior in Romania were made in case of intensive and super – intensive plantations. (Bunea, 2002; Drăgănescu, Mihuț, 2003; Drăgănescu, Mitroi, 2001; Ghena, Braniște, 2004)

The appearance of these resistant apple varieties grafted on reduced rootstocks (M9, M26), have increased the density of trees per ha with major repercussions on the production of fruits / ha. (Șcheau, Laslo, 2003, Stănică, Braniște, 2011, Gonda, 2003, Petre, 2009)

In Romania the immune or genetic resistant cultivars at the main disease are multiplied. The cultivars are from Romania (Generos, Pioner, Poiana, Diana, Romus 1, 2, 3) and from abroad (Prima, Florina etc.) (Grădinnariu, Istrate, 2009)

Different studies are made regarding the establishing the best cultivars; a research programme for new cultivars with genetic resistance at the disease and with better quality of the fruits are sustained. (Ghena, Braniște, 2003)

The introduction of the cultivars with genetic resistance at the disease (Romus 3, Romus 4, Aura, Prima, Florina, Liberty) has the advantage of the treatments number smaller with 50% and the substantial decrease of the fuel and pesticides used and environment protection (Stănică, Braniște, 2011)

Higher productions can be obtained every year by applying appropriate technologies to put particular emphasis on nutrient management required amount of trees, irrigation to be done in moments when apple culture and water deficit due to low rainfall is

in excess and repeated works to maintain soil-free culture of weeds. (Gonda, 2003, Hoza, 2003)

MATERIAL AND METHOD

In 2002 branches were collected from SCDP Oradea, in case of the following apple cultivars, resistant to scab and powdery mildew: Florina, Liberty, Romus 3 and Auriu de Bistrița.

In the nursery placed on the phreatic wet chernozem at Berechii, Bihor county these varieties were grafted on rootstock M 26 and were planted in the spring of 2004 at four meters between the rows and two meters per row (1250 trees per ha) linearly with twelve trees per variant (4 replications of 3 trees).

Yearly were administered 150 kg of N, 100 kg of P₂O₅ and 200 kg of K₂O in the first four years after planting, and 250kg of N, 250kg of P₂O₅, and 250 kg of K₂O in the following years.

Between the rows dead fallow was maintained by repeated disc and milling works, and on the rows hand work was performed in the first three years after planting, after which herbicide was administered with a Roundup of 3 l/ha in the following years, as well as mechanical and manual mowing.

The measurements and determinations referred to:

- **The main fructification phenophases**

Blooming – There were recorded daily, based on experience, the date of first flowers blooming, as well as the end of blooming, being taken into account the date when the petals were shaken off under the tree.

Harvest maturity – Starting from the 10th of July, it has been recorded daily, near each variety the beginning of early harvest maturity, till the end of harvest season.

- **The surface of trunk section**

There were measured with the caliper, in case of each tree, the average of two diameters being determined by calculating the radius. The formula was applied: $\frac{\pi R^2}{2}$

determining the surface of trunk section in cm².

- **Fruit production per ha**

Fruit production – In case of each tree out of those 12 per variant, the fruits were completely harvested and were weighed in kilograms/tree, the sum of those 12 was calculated and determined the kg of fruits/variety, then reported per hectare.

- **The physical – chemical indices of fruits (size index, weight index and the dry substance determined refractometrically)**

Size - the large diameter, the small diameter and the height were measured with caliper in the case of 25 fruit samples, it was determined the average of those 75 measurements, after which it was calculated the size of fruit in millimeters, applying the formula:

$$\frac{D+d+h}{3}$$

Weight – Samples of 50 fruits were weighed using the analytical balance, then it was determined the average weight in grams (g).

The dry substance – refractometric.

All this data was statistically processed using the variance analysis method.

RESULTS AND DISCUSSIONS

In table 1, the main fructification phenophases are presented in case of the studied apple varieties and hybrids.

Early blooming starts on the 10th of April in case of Liberty variety and ends on the 16th of April in case of Auriu de Bistrița variety.

The end of blooming starts with the Auriu de Bistrița variety on the 24th of April, and ends on the 28th of April in case of Liberty variety.

Determined as number of days, the blooming period is staggered between 8 days in case of Auriu de Bistrița variety and 18 days in case of Liberty variety.

As ripening period, Romus 3 is harvested within 10 – 20 of July, being a summer variety, and the others after the 20th of September.

Table 1

The main fructification phenophases in case of apple varieties and hybrids
(Averages 2004-2013)

No	Variety or hybrid	Blooming			Harvest maturity	
		Beginning	Depth	Ending	Beginning	Ending
1	Florina	14 - IV	20 - IV	26 - IV	01 - X	10 - X
2	Liberty	10 - IV	18 - IV	28 - IV	01 - X	10 - X
3	Romus 3	11 - IV	16 - IV	26 - IV	10 - VII	20 - VII
4	Auriu de Bistrița	16 - IV	20 - IV	24 - IV	20 - IX	30 - IX

In table 2, the surface of the trunk section is presented in the 9th year after plantation.

Compared to the average of those four cultivars taken into account in our study, we have highly vigorous varieties: Liberty, Auriu de Bistrița, statistically ensured as highly significant, varieties of medium vigor: Florina, and poorly vigorous varieties: Romus 3, statistically negatively ensured as very significant.

Table 2

The surface of trunk section in the 9th year after plantation
in case of apple varieties and hybrids

No.	Variety or hybrid	The surface of trunk section - 2013 -		±d (cm ²)	Significance
		Absolute (cm ²)	Relative (%)		
1	Liberty	80.2	153.1	+27.8	xxx
2	Auriu de Bistrița	77.8	148.5	+25.4	xxx
3	Florina	52.4	100.0	-	-
4	Average (Mt)	52.4	100.0	-	-
5	Romus 3	33.4	63.7	-19.0	ooo

LSD5% = 6.3; LSD1% = 8.5; LSD 0.1% = 11.4

In table 3 it is presented the fruit production in those three years of study. Medium productions vary between 19.2 t/ha in case of Romus 3 variety, up to 48.2 t/ha in case of Florina variety.

The cultivars: Florina with 48.2 t/ha, Auriu de Bistrița with 45.5 t/ha, and Liberty with 42.0 t/ha are statistically positively ensured as highly significant. Romus 3 is statistically negatively ensured as highly significant.

In table 4, the physical – chemical averages of the studied apple varieties are presented.

The weight index varies between 114.2 g for Romus 3 variety up to 186.7g for Florina variety.

Except for the Romus 3 variety, all other varieties fall into groups with large and very large fruits.

Table 3

Fruit production in case of disease – resistant apples, (2011- 2013)

No.	Variety or hybrid	Production (t/ha)			Average production		±d (t/ha)	Significance
		2011	2012	2013	Absolute (t/ha)	Relative (%)		
1	Florina	40.8	48.4	55.3	48.2	143.4	+ 14.6	xxx
2	Auriu de Bistrița	38.2	44.7	53.5	45.5	135.4	+ 11.9	xxx
3	Liberty	31.3	42.6	52.2	42.0	125.0	+ 8.4	xxx
4	Average (Mt)	26.2	32.3	42.4	33.6	100.0	-	-
5	Romus 3	11.6	17.4	28.7	19.2	57.14	- 14.4	ooo

LSD 5% = 4.2 ; LSD 1% = 5.6 ; LSD 0.1% = 7.3

Table 4

Physical – chemical characteristics of fruits (Averages 2011-2013)

No.	Variety or hybrid	Size index (mm)	Weight index (g)	The dry substance (%)
1	Florina	74.2	186.7	12.8
2	Liberty	63.6	123.2	12.1
3	Romus 3	61.1	114.2	12.3
4	Auriu de Bistrița	69.2	142.1	10.9
5	Average (Mt)	67.1	141.5	12.0

Values of the dry substance above 12% are present in case of Florina, Liberty and Romus 3.

CONCLUSIONS

The cultivation of apple may be super-intensified by planting trees at close distance (4/2, 4/1, 3/2, 3/1 m) on a phreatic wet chernozem and managing the trees in palmetto system, orienting the branches in row direction.

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Fruit quality planted at a close distance is insignificant, influenced by reducing their size. Values of the dry substance above 12% are present in case of Florina, Liberty and Romus 3.

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